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Auditory/visual word-identification materials for Spanish speakers

Linda J. Grace
San Jose State University

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Grace, Linda Joanne, M.A.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

AUDITORY/VISUAL WORD-IDENTIFICATION MATERIALS FOR SPANISH SPEAKERS

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APPROVED FOR THE DIVISION OF SPECIAL EDUCATION
AND REHABILITATIVE SERVICES PROGRAM IN
COMMUNICATION DISORDERS AND SCIENCES

June K. McCullough, Ph.D.

Minerva Galvan, M.A.

Richard H. Wilson, Ph.D.

APPROVED FOR THE UNIVERSITY

Serena M. Stanford

ABSTRACT

Auditory/Visual Word-Identification Materials for Spanish Speakers

By Linda Grace

The purpose of this investigation was to obtain normative data for auditory/visual word identification test materials developed for Spanish-speaking adults. Subjects were 40 native Spanish speakers with normal hearing. The subjects listened to auditory stimulus words presented through earphones. Twenty subjects responded by repeating what was heard orally and 20 subjects pointed to the color picture representing the auditory stimulus from a test foil presented on a computer monitor. These results provided normative performance data for the Spanish auditory/visual materials and were discussed in terms of comparison with conventional Spanish word-identification tests.

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INTRODUCTION

Audiologists assess the auditory capabilities of individuals with hearing loss in order to determine if communication difficulties exist. The word-recognition test is an integral part of the standard audiological assessment. In this test, the client is asked to repeat 25 or 50 words heard through earphones or loudspeakers that are presented at a comfortable listening level. A person with normal hearing usually is able to repeat most, if not all of the words, resulting in 80-100% correct performance, whereas a person with a sensorineural hearing loss may get a much lower score. In the latter case, even though speech is at a comfortable level, the words are not clear due to physiological changes in the auditory system and/or the inaudibility of certain frequencies that are important for speech.

The word-recognition test also is useful for determining the site of the auditory pathology for a patient with a hearing loss. For example, a patient with a retrocochlear hearing loss (when the lesion is beyond the cochlea, in the auditory nerve) often will demonstrate a progressive decline in word-recognition ability with an increase in presentation level (usually at 90-100 decibels at hearing level [dB HL]).

Audiologists often evaluate patients who are not native speakers of English. For many of these patients, conventional test procedures and materials must be modified in order to obtain accurate results. For example, word-recognition materials in English are not appropriate for non-native speakers since it is unclear whether resultant errors are due to

language/articulation constraints or auditory problems. Unfortunately, at the present time, when non-native English speakers are seen by an audiologist, the word-recognition test often must be omitted from the evaluation.

With auditory/visual materials, the patient is shown a set of response foils consisting of four or six words or pictures. The patient responds by pointing to the written word or picture that represents the auditory stimulus. This type of material can be helpful when evaluating non-English speaking patients because the auditory stimulus words are presented in the patient's language. The audiologist scores the test by noting whether the patient has pointed to the appropriate word or picture. Therefore, the audiologist does not need to be able to understand the language to score the test.

Statement of Significance

In a nation where Spanish is rapidly becoming the second language, more materials are needed to accurately evaluate the hearing of Spanish speaking patients; therefore, the standardization of Spanish auditory/visual materials will improve the ability of audiologists to accurately assess the effects of hearing loss on communication for these patients.

Research Questions:

1. What is the psychometric function of the Spanish auditory/visual materials as compared to the English version of auditory/visual test materials?
2. How do the findings of this study fill the needs of a Spanish word-recognition test?

Hypotheses:

It was hypothesized that:

1. An English speaking examiner will be able to administer an auditory/visual word-identification test to Spanish-speaking individuals.
2. There will be no significant difference in performance between the Spanish auditory/visual materials and the conventional (open-set) Spanish word-recognition materials at high intensity levels.

CHAPTER II

REVIEW OF THE LITERATURE

The word-recognition test is a standard element in the audiological evaluation. Often, however, it must be eliminated from the test battery when a native Spanish speaker is seen by an English-speaking audiologist. Although using auditory/visual materials to obtain word-recognition performance would be appropriate for these patients, currently there are no commercially available auditory/visual materials for adult Spanish speakers. This literature review will examine the development and standardization of Spanish word-recognition tests (conventional, auditory-only approach) and auditory/visual materials for Spanish speaking children. In addition, the auditory/visual materials developed originally for English speakers known as the Picture Identification Task (Wilson & Antablin, 1980) will be discussed.

Picture Identification Task

A Picture Identification Task (PIT) was developed to estimate the word-recognition ability of non-verbal adults (Wilson & Antablin, 1980), including people with expressive aphasia or other communicative problems that might affect the intelligibility of speech production. It was hypothesized, that although some patients would be unable to respond orally, they would be able to point to a picture. This study established normative psychometric functions (correct performance as a function of intensity level) for these materials and compared the results with an established auditory-only word-recognition test.

Consonant nucleus consonant (CNC) words and three rhyming alternatives that could be illustrated simply were chosen as test items from the

Teacher's Word Book of 30,000 words (Thorndike & Lorge, 1944). The drawings then were grouped into response plates consisting of the test word and the three alternative words randomly positioned in one of the quadrants.

In the first experiment, the relationship between the performance intensity functions obtained in quiet and in noise for the Picture Identification Task and a standard word-recognition test, the Northwestern University Auditory Test No. 6 (N.U. No. 6), was examined. Subjects were 16 normal hearing adults ($\leq$ 15 dB Hearing Level [HL] at octave intervals between 250 and 8000 Hz) with a mean age of 21 years old. An open-set response paradigm, in which the subjects wrote their responses, was used with both materials and conditions. In the quiet condition, subjects listened to words under earphones in 4 dB increments from - 2 to 26 dB re: the speech-recognition threshold (SRT). The noise conditions were administered at 8 signal-to-noise ratios from -12 dB to 16 dB. The level of the broadband noise was held constant at 70 dB sound pressure level (SPL).

Wilson and Antablin (1980) concluded from the results in experiment one that "the performance intensity functions obtained in an open-set paradigm with the Picture Identification Task materials are equivalent to the functions generated with the N.U. No. 6 materials" (p. 231). Therefore, they found the mean difference between the Picture Identification Task and the N.U. No. 6 materials in an open-set response paradigm in quiet or in noise to be non-significant.

In Experiment 2, the Picture Identification Task in a closed-set response paradigm was compared with the N.U. No. 6, both in an open-set and a closed-set response paradigm. Subjects were 24 normal hearing adults with a mean age of 24 years. The subjects responded to the Picture Identification Task by

pointing to a picture in one of the quadrants. The subjects responded to the N.U. No. 6 open-set by writing the stimulus word on an answer sheet, and to the N.U. No. 6 closed-set by marking the appropriate word on a multiple choice answer sheet. Each test word in the closed-set modification of N.U. No. 6 was grouped with three rhyming words.

The differences among the three experimental conditions were significant. The standard deviations were largest with the Picture Identification Task, indicating that this response was the most variable of the three. The smallest variability was with the word identification (N.U. No. 6 closed-set). The identification of words was easier than the identification of pictures. It was suggested that the differences could be due to additional cognitive processes needed to transform a picture into a lexical unit. Although the three response tasks produced different performance intensity functions, the data indicate that at high stimulus-presentation levels (26 dB re: the speech-recognition threshold), equivalent results were achieved.

The Use of a Nonsense Syllable Test with Spanish Speaking Patients

Since most of the Hispanic patients seen for audiological testing in this country have had some exposure to English, and since Spanish materials are not widely used, Danhauer et al. (1984) suggested it would be helpful to know how these patients, especially bilingual persons, perform on English tests of speech sound discrimination. A nonsense syllable test (NST) was used to see if it was useful in assessing speech sound discrimination abilities of native monolingual English and Spanish speakers, and Spanish-English bilingual speakers.

In this study, subjects were 29 people between 13 and 53 years of age with normal hearing (≤ 20 dB HL at octave frequencies from 250-8000 Hz). Subjects were selected from three native language backgrounds. Ten subjects were monolingual English speakers. Ten were predominantly Spanish speakers who had been exposed to English in an adult education class but did not routinely converse in English or use it to obtain information. Nine subjects were fluent bilingual speakers who could carry on a conversation completely in either English or Spanish, and who had acquired their second language, usually English, before age 7.

None of the subjects had speech production errors in their native language. This was determined by administering articulation tests. Testing was conducted using materials from the Medida Española de Articulación (La Meda, Mason, Smith, & Hinshaw, 1969) for Spanish speakers and the Photo Articulation Test (PAT; Pendergast, Dickey, Semar, & Soder, 1968) for the English and bilingual speakers.

The subjects were presented List A of the NST at five ascending sensation levels, (25, 35, 45, 55, and 65 dB re: each subjects SRT). Finally, the NST was given face to face to assess their performance on the task under optimal conditions. The bilingual and the Spanish subjects also were asked to identify any NST items which had meaning to them. Danhauer et al. (1984) used both auditory and visual cues to phonetically transcribe the responses.

The Spanish group performed significantly poorer than the English and bilingual groups, which differed very little. Perception of vowels and consonants were quite different among the three groups. According to the scores, English speakers could recognize vowel sounds with less difficulty than

consonants. This trend was just the opposite for the Spanish and bilingual groups in this study, since the vowels were more difficult to recognize than the consonants for these subjects. Three consonants and five vowels rarely occur in the Spanish language but their frequent use in the NST was suggested to account for many of the Spanish speaker's errors.

The Spanish speaking group did not perform well on the English sound recognition task; therefore, Danhauer et. al. (1984) concluded that it would be more advantageous to pursue the development of Spanish materials for Spanish-only speakers that can be accurately scored by English-speaking audiologists.

Determination of Phonetic Balance in Spanish Words

Berruecos and Rodriquez (1967) took the percentage of each of the 22 phonemes of the Spanish spoken in Mexico City to form phonetically balanced lists of trochaic words. The words were selected from daily papers, the two most widely read books in Mexico City, song books and words used by the Linguaphone Method of teaching the Spanish language, and words recording spontaneous conversations on various topics. From a total of 500,000 words, a statistical sample of phonemes was made. From this sample, 20,000 words were taken, chosen with the help of aleatory tables, which represented 4% of the total of studied words.

Of the 20,000 studied words, a total of 954 trochaic words were found. These words were phonetically analyzed, and lists of 25 phonetically balanced words were compiled. The percentage of the phonetic content of each list was controlled to correspond to that of the Spanish language. However, it was not possible to find a list whose phonetic content exactly matched with the

proposed percentage, due to the fact that the number of phonemes of each trochaic word is, on average, 4.718; that is in 25 words the number of phonemes would be 117.95. Therefore, each phoneme contributes a portion equal to 0.847%. For example, in lists of 117.95 phonemes, the percentage total found for each phoneme was a multiple of .847.

Multiple Choice Word Recognition Lists for Spanish Patients

Cancel (1965) developed a list of words common to countries in the Americas where the Spanish language is spoken that could be used to measure word-recognition ability for these patients. Another goal of the study was to find a "confusion" vocabulary that might be used with the original item in the response form of a multiple-choice type word test for speech recognition.

The bisyllabic "grave" word was chosen because it was the most frequent stress accent pattern in the Spanish language. Also, when both syllables are equally stressed, the "grave" word is the closest word to the English spondee. The words were selected from a sample of 2,962 words obtained from newspapers of 19 Spanish-American countries. One thousand test items were selected and assigned in a scrambled order to 20 lists of 50 words.

The words were recorded by ten "Spanish American" students. Each word was preceded by a carrier phrase "Numero uno..., dos...," and an interval of 3 to 5 seconds occurred between each word and the next carrier phrase to allow enough time for the listeners to write the responses on a prepared answer sheet.

Sixty-five "Spanish American" subjects listened through earphones to 20 lists of "grave" words as recorded by one speaker. First, the speech signal (75 dB re: .0002 dyne/cm/2) was presented with 85 dB noise. The noise level was

determined by measuring voltages across the terminal of the headsets. Thus, the signal to noise ratio theoretically was -10 dB. Second, the lists were given in a condition of quiet with the signal level the same as it had been in the noise condition.

All the error-responses to each one of the 1,000 test items and the intelligibility value, in quiet and in noise, were assembled on 1,000 cards (one per word) for the selection of a list of confusion words. The three most common error-responses were retained and a multiple-choice intelligibility list was developed.

The coefficient correlation between the values for noise and for quiet was .53. An analysis of variance which tested the equivalence of the intelligibility of the 20 lists in the noise condition showed no significant differences among the individual lists. A triple analysis of variance showed no significant differences among the lists and listening conditions.

Cancel suggested factors that appeared to affect the intelligibility of Spanish words: (1) the accented syllable, (2) the presence of four orthographic-phonetic units, as opposed to a larger number in a word, (3) terminal vowels, as opposed to terminal consonants in a word, (4) the occurrence of a vowel-consonant order, as opposed to the consonant-vowel order, in a syllable, and (5) the presence of the phonemes /f/, /wa/, /al/.

Factors to be Considered for Spanish Speech Audiometry

Cancel (1968) studied many factors that he suggested should be considered in the development of Spanish speech-recognition tests. The intelligibility of Spanish monosyllables and Spanish bisyllables was tested and analyzed statistically. The results were that monosyllables produced low

intelligibility scores whereas bisyllabic words produced higher intelligibility scores. He also suggested that the degree of difficulty of the test material is one of the main factors that should be assessed in the development of a test for word-recognition. The material should be intelligible since the finer discrimination of the sounds is better accomplished and more exactly measured in an intelligible word. Words ending in vowels had higher mean intelligibility values. The presence of sounds /s, e, i/ in the Spanish words might decrease the intelligibility of these words. The error responses of a list of 37 Spanish phonemes revealed that the /s/ sound was omitted most of the time at the end of words and was always omitted in plural forms formed by the addition of the letter s.

Evaluation of Four Spanish Word-Recognition Lists

Weisleder and Hodgson (1989) evaluated one of the commercially available Spanish word-recognition ability tests from Audiotec of St. Louis as "Spanish Speech Discrimination Lists 1-4." The lists were evaluated in terms of interlist equivalence, word difficulty, intelligibility of the talker, and percentage of increase of recognition ability per decibel increment. The lists were composed of four lists of 50 words. Each word was preceded by the same carrier phrase: "Diga usted..." (You will say). Most of the words were bisyllabic and tetraphonemic with more stress on one syllable then the other, that is called paroxytone. The four lists were presented at each of four presentation levels: 8, 16, 24, and 32 dB.

The subjects were 16 native Spanish speaking college students with a mean age of 27 years. The country of origin and the number of subjects per country were: Mexico, 9; Panama, 2; Venezuela, 2; Spain, 1; Honduras, 1; and

Colombia, 1. All subjects had an SRT in Spanish of 0 dB HL or better, and none failed the hearing screening levels set for the investigation (10 dB HL, 250-8,000 Hz).

The material evaluated consisted of four Spanish language word recognition ability lists recorded by a native-speaking male at a professional laboratory. The lists were composed of 50 words, each one preceded by the same carrier phrase: "Diga usted...:" (You will say). Most of the words were paroxytone words (bisyllabic and tetraphonemic with more stress on one syllable than the other). Instructions prior to the test were: "Usted escuchara una grabación en la que se le pedira que repita unas palabras, por favor hagalo, y adivine si es necesario" (You will listen to a recorded voice that will ask you to repeat some words, please do so and guess if necessary).

The results indicated that the ranges of scores were very broad at the low presentation levels, but as intensity increased the psychometric functions concurred. The mean percent correct at 8 dB HL was 22.5%, at 16 dB HL was 56%, at 24 dB HL was 82% and at 32 dB HL was 94.5%. Subjects from Mexico obtained better scores at the low presentation levels than subjects from the other countries in this study. The great improvement in performance of most subjects at the 8 dB condition was indicated to demonstrate a learning effect. Variability of scores at the low presentation level was attributed to the use of 5 dB steps for obtaining the SRT. For example, if the true SRT for a person was 2 dB, then the measured SRT was 5 dB because of the step size. The actual sensation level (SL) at which this subject heard the first list was 16 dB (8dB SL presentation level re: the measured 5 dB from SRT + 3 dB from true SRT).

Statistical analysis indicated that the intelligibility of list three was significantly different than the other lists at the .05 level. Mean intelligibility of list three was poorest at all presentation levels except 8 dB HL.

As in previous studies, the most frequently missed words had the presence of the /s/ sound in one or two positions. The regional dialect of the speaker of the recordings did not differentiate among the letters s, z, and c. All of these letters, therefore, could be pronounced as /s/, reducing the phonetic clues. The letter c is pronounced as /s/ if followed by e or i, and as /k/ if followed by a, o, u or a consonant. Of the words that were missed most often, those with the /s/ sound in the final position are the plural forms of words. Those words retain their meaning even after deletion of the final /s/. In 12 of the 20 most missed words was the phoneme /t/. This sound was often substituted for the sound /k/. These two voiceless stops can sometimes be interchanged and still yield a meaningful word.

All of the subjects considered that the speaker of the recording spoke a "standard Spanish" and the intelligibility of his speech was judged to be very clear. Word-recognition scores of 90% or more were obtained by all subjects in one or more list. The psychometric function of the Spanish lists was similar to the psychometric function of English monosyllabic words. The Spanish words used in this study lost their meaning if one of the syllables was omitted; therefore, they were not like spondaic words in which each half of the word has meaning by itself. The authors concluded that the psychometric functions of Spanish bisyllabic words were comparable to the psychometric functions of English monosyllabic words because of similarities between the two sets of words; therefore, except for list three, the material evaluated in this investigation

was acceptable for testing word-recognition ability of Spanish speaking patients.

Children's Spanish Word Discrimination Test for Non-Spanish-Speaking Clinicians

Comstock and Martin (1984) developed a word-recognition test to assess the word-recognition ability of Spanish speaking children. The test was developed as a picture-pointing task to elicit the cooperation of the children. Words used were within the vocabulary of central Texas children whose predominant language was Spanish. The words were bisyllabic with the final vowel of consonant-vowel-consonant-vowel words remaining constant to reduce the amount of linguistic information. Both the Spanish and English translations were recorded on separate channels, thus enabling the English-speaking clinician to monitor the test while the patient heard the Spanish version.

Once the test was designed, two questions Comstock and Martin (1984) asked were: (1) "Can the four lists be used interchangably to determine word recognition ability? and (2) Are preschool children, whose dominant language is Spanish, able to perform the task of identifying the appropriate picture when the recognition stimuli are presented at a comfortable listening level "(p. 167)? In order to obtain a more accurate assessment of the lists, adult subjects were used to answer the first question.

A male of Texas who was fluent in Spanish was the speaker for the tape recording. The carrier phrase before each stimulus word was, "Apunta con el dedo, meaning "point with your finger." The first word of each phrase was separated by 5 seconds. The English translation of each word was on the

second track of the tape, so that it could be heard as the last word of the carrier phrase that was repeated on the first track.

Black and white line drawings represented each stimulus word. Six pictures, four of which were stimulus words and two were foils, were copied on 8 x 11 plates. The picture book was comprised of 25 plates.

Fifteen adults were used for the first experiment. All subjects passed a pure-tone screening test at 10 dB HL for 250-4,000 hertz (Hz) in the test ear and were native Spanish speakers raised in Texas. Pure-tone air-conduction thresholds at 500, 1000, and 2000 Hz were determined. Their pure-tone average was determined by the three thresholds at 500, 1,000 and 2,000 Hz and rounded to the nearest or next largest even number. This average was used as the reference level for the word-recognition testing.

All the lists were presented at 0, 8, 16, 24, 32, and 40 dB above the pure-tone average. Each subject wrote down each word they heard. To eliminate the possibility of a learning effect, the lists were presented at one presentation level before the intensity was increased. The answers were reviewed to find any words that were not intelligible or spelled incorrectly.

Results revealed that at 32 and 40 dB SL, the lists varied by less than 4%; therefore, the results indicated that for clinical purposes the four listed are essentially equivalent. The performance intensity functions for each list are similar to the average functions of established discrimination tests. The words that were particularly difficult were "cuna" in list 1, "foca" in list 2, and " foca" in list 3. The stimuli that were easy to understand in list 4 were "cara, carro, and chiva."

Twenty children aged 3-8 years whose dominant language was Spanish and lived in central Texas for their whole life were subjects for experiment 2. Air-conduction pure-tone thresholds were obtained for each subject at 250-4,000 Hz. When possible the thresholds were obtained using the same method as in Experiment 1; however, it often was necessary to use play audiometry. When a difference was noted between ears, the better ear was used. All speech stimuli was presented at 50 dB HL. After the test was completed each word missed was shown to the subjects who were asked to name the pictures.

The data showed a general increase in recognition score with an increase in age. Many of the words were missed due to a limited vocabulary; however, whether the words were missed because of unknown vocabulary or unrecognizable pictures is not known. In isolation, some of the pictures were not recognizable; for example: ala (bird's wing), pasa (raisin), paño (handkerchief), roto (torn), and oro (gold). Some confusion was evident between "burro" (donkey) and "perro" (dog), both of which were presented on one plate. "Tía" (aunt) and "risa" (laughing) on one plate also seemed to confuse the children and distort the results.

In conclusion, the results indicated that this test may be a useful method for assessing word-recognition ability using a picture-pointing paradigm as long as vocabulary is taken into consideration. Reviewing the incorrect responses (by having the child say what the picture is) appeared to be a good way to check for unknown vocabulary. Finally, an English-speaking clinician may be able to administer this test without giving verbal instructions. Hearing only the carrier phrase "Apunta con el dedo" (point with your finger) the subjects were able to perform the task with minimal practice.

Comstock and Martin (1984) concluded that it is possible to construct a recorded word discrimination test that can be used with children whose language is not spoken by the examining clinician. The accuracy of this mode of administration for determining word recognition ability in hearing impaired subjects, however, is presently under investigation. Finally, the test has not been distributed commercially for routine clinical use.

Chapter Summary

A picture pointing multiple choice task for determining word recognition ability was shown to be reliable for both adults and children (Wilson & Antablin, 1980; Comstock & Martin, 1984). This mode of administration also was recommended as a good way for non-Spanish speaking audiologists to accurately assess word recognition ability.

It was found that dialectal differences were very hard to overcome when evaluating word-recognition lists. Every Spanish country and region has its own articulation pattern that makes recognition difficult (Weisleder & Hodgson, 1989). One common word-recognition pattern for Spanish speakers was that consonants are easier to recognize than vowels (Cancel, 1985; Danhauer et al., 1984).

In summary, to assess word-recognition performance in a Spanish speaking individual, the test materials need to consist of common, bisyllabic or trisyllabic words. Most tests evaluated were adequate for determining word recognition ability for adult Spanish-speakers (except for the nonsense syllable test), but none are commercially available that could be scored by an English-speaking audiologist. The goals for this study, therefore, were to standardize auditory/visual materials for Spanish speakers using a computer-based format

and to demonstrate the ability of an English-speaking audiologist to administer the test.

CHAPTER III

METHODOLOGY

When a Spanish-speaking client is evaluated by an English-speaking audiologist the word-recognition test often cannot be administered. This is because it would be unclear if errors were made due to language/articulation limitations or auditory problems. A picture-pointing task may alleviate this problem, since words could be presented in Spanish and the audiologist would score the test by noting whether the patient points to the appropriate word or picture. The purpose of this study was to obtain normative data for Spanish auditory/visual test materials using native Spanish-speakers as subjects.

Research Design

This project described the development of Spanish auditory/visual word-recognition materials, and examined how performance of Spanish speakers using the materials compared to the reported performance (1) of Spanish-speakers using conventional Spanish word-recognition materials and (2) of English-speakers on the corresponding English auditory/visual materials. An experimental research design was implemented in which percent correct performance was obtained at 4 sensation levels (0, 8, 16, 24 dB), both in oral open-set and pointing closed-set conditions.

Test Materials

The vocabulary from the Picture Identification Task (Wilson & Antablin, 1980) originally developed for non-verbal adults served as the structure for the Spanish auditory/visual materials. Each of the 213 target and alternative words from the Picture Identification Task were translated into Spanish by a bilingual

speaker. When the exact translation was unclear, the Bantom English/Spanish Dictionary was consulted. When several alternative definitions or idiomatic expression occurred for a word "Vox Compacto Diccionarrio de la Lengua Española" provided further definition to precise meanings or words.

Next, the translated words and their corresponding pictures were shown to two native Spanish speakers (countries of origin: Puerto Rico and Mexico). Both of the consultants were familiarized with the purpose of the test materials and were asked to eliminate vocabulary items that had various meanings or were culturally biased. For example, "mow" was rejected on the grounds that it was not commonly employed in many Spanish-speaking countries. Another word that was eliminated was "curl," since the Spanish equivalent varied across each country. Finally, each word was examined in a qualitative way for frequency of usage and rejected if it appeared infrequently in Spanish culture. For example, the word "(gas) gauge" was eliminated under this criteria. Of the the 213 original English vocabulary items, 113 were eliminated, leaving 100 translated items. The remaining Spanish vocabulary items were categorized by syllable length (two and three syllables), gender and grouped based on acoustic/phonetic similarity. Twenty-five, four-word groups were defined with two words in each group of four foils designated as "target words." Thus, a 50-word list was constructed. A complete listing of the four-word groups with the target words highlighted (as translated from the Picture Identification Task [Wilson & Antablin, 1980]), are in the Appendix.

The list of Spanish target words was recorded by a female speaker (country of origin: Mexico) in the following manner. The speaker was seated in a sound treated room in front of a condensor microphone (AKG acoustics,

Model C460B). A sound level meter (Brüel Kjaer, Type 2203) sat next to the microphone to enable the speaker to monitor her vocal output. The microphone was connected to a preamplifier (Symetrix, Model SX 202), then to an amplifier (Tascam, Model M-208), and passed to an analog/digital board (Antex, model SX-10). Each of the words and the carrier phrase, "Enseñame....." were repeated twice and were stored in two separate files on a computer hard disc. The waveform of each word was analyzed for cuts or peak clipping. The final decision for which trial word to record was made auditorily. The recording of the tape was done by converting the digital/analog files to analog/digital and re-recording them via a digital audio recorder (Sony, Model PCM 2500A; digitized at 44.1 KHZ).

The digital tape recording was played into a Macintosh recorder for computer storage in "audio" files. Additionally, the picture foils representing the target word and three alternatives were scanned into the computer memory in "visual" files. A software program linked the audio and visual files for test presentation via a Mac IIsi computer.

Subjects

Subjects for this study were 40 students and faculty from San Jose State University. The first 20 subjects who volunteered and met the criteria were selected as subjects for the oral, open-set conditions. This group included nine subjects from Mexico, two from Puerto Rico, one from Colombia, one from Nicaragua, one from Costa Rica, one from El Salvador and five from Southern Texas and San Jose, California, all of whom were native Spanish speakers. Subjects' ages ranged from 19-55 years old with a mean age of 29.4 years.

The next 20 subjects participated in the pointing, closed-set conditions. Of the 20 subjects, 10 were from Mexico, two were from Paraguay, two were from El Salvador, two were from the Los Angeles area and southern Texas, one was from Ecuador, one was from Colombia, one was from Spain and one was from Peru. These subjects' ages ranged from 18-35 years with a mean age of 25.2 years.

Procedures

All subjects were given an audiological evaluation using the following protocol:

1. otoscopy,
2. screening tympanometry; all subjects had single-peaked tympanograms with normal admittance values,
3. pure tone audiometrics; threshold $\leq$ 15 dB HL at octave intervals from 250-8000 Hz in the test ear. Thresholds at 500, 1000, 2000 Hz, were obtained in 2 dB steps in order to calculate a precise pure-tone average (PTA).

For all test conditions, subjects listened individually to the 50 word list through TDH-59 earphones at two sensation levels chosen from the following four levels: 0, 8, 16, and 24 dB re: PTA at 500, 1000, and 2000 Hz. Since each subject listened at two sensation levels, a total of ten data points were obtained for each of the four test levels.

In the oral conditions, the test list was presented at the lower sensation level first to reduce learning effects. The instructions given to each subject in Spanish were, "Usted va a oir cincuenta frases como 'enseñame mesa.' Por favor, repita la palabra siquiente a 'enseñame.' Es posible que no se oiga bien

las palabras pero adivine si es necesario." The English instructions were, "You will hear 50 phrases, for example 'enseñame mesa.' You just need to repeat each word following 'enseñame.' " To administer the oral test conditions, the examiner was seated in the control room in front of a computer monitor. On the computer monitor was a list of the target words and alternatives. The examiner pointed and clicked with the "mouse" on the target word and the word was directed from the sound port of the computer through an audiometer (GSI, Model 16) to the test earphone in the test room at the correct sensation level. The examiner who spoke both English and Spanish, listened to the subject's oral response and wrote down any incorrect responses on the response sheet.

For the pointing conditions, the 20 subjects similarly listened to the test list at two of the four sensation levels, with the lower level presented first. The instructions for the second experiment were, "Indique con su dedo la photo que representa la palabra que Usted oye. Si es necesario adivine!" In English instructions were, "Point to the picture you think represents the word you heard. If you are not sure guess!" In these conditions, each subject sat in the test room facing a computer screen, while the examiner sat in the audiology control room. The examiner was able to visualize the subject's response monitor through the window of the control room. As the examiner pointed and clicked on the target word, the computer monitor in front of the subject was "drawn" with the response foils, and finally the auditory word was directed to the test earphone at the appropriate sensation level. Subjects pointed to one of the pictures on the screen and the examiner recorded all incorrect responses.

Data Analysis

The percent correct recognition/identification was averaged for each sensation level in the oral and pointing conditions to establish psychometric functions (percent correct as a function of presentation level). Standard deviations also were calculated for each test condition. The results were compared both with the reported results from conventional Spanish word-recognition tests as well as with the auditory/visual word-recognition task (Picture Identification Task) in English.

CHAPTER IV
RESULTS

The purpose of this research was to obtain normative data on a Spanish auditory/visual word recognition test. Forty subjects listened to a list of 50 Spanish words at two of four sensation levels (either 0, 8, 16, and/or 24 dB). Twenty of the subjects repeated the words orally and 20 subjects pointed to the corresponding color picture of the auditory stimulus on a computer monitor.

The individual data from the oral, open-set conditions are presented in Table 1, in which percent correct is shown at each sensation level (re: PTA) for each subject. Since subjects listened to two SLs, some spaces in the table do not contain values. Mean percent correct values and standard deviations (S.D.) for each level also are given. Percent correct performance ranged from 38.0 at 0 dB SL to 98.4 at 24 dB SL. Standard deviations were 19.6 at 0 dB SL, 6.3 at 8 dB SL, 4.7 at 16 dB and 1.3 at 24 dB SL.

The individual data from the pointing, closed-set conditions are shown in Table 2. As in the first table, the percent correct performance at each sensation level is shown along with mean percent correct performance and standard deviations (S.D.). For the pointing conditions, mean percent correct performance ranged from 82.0 at 0 dB SL to 98.4 at 24 dB SL. Standard deviations were 6 at 0 dB SL, 3.2 at 8 dB SL, 4 at 16 dB SL, and 0.9 at 24 dB SL.

The psychometric functions for both oral, open-set and pointing, closed-set conditions are give in Figure 1. Here, mean percent correct performance is plotted as a function of sensation level. Data from the oral conditions are

represented by circles, and data from the pointing conditions are represented by squares. Performance clearly was better in the pointing condition at each sensation level, reflecting the easier nature of the closed-set task.

Table 1

Individual Subject Data from the

Oral Open Set Condition

Subject Number	0 dB SL	8 dB SL	16 dB SL	24 dB SL
1	64%	88%		
2	34%		94%	
3	32%			100%
4	2%	80%		
5	34%		92%	
6		82%	94%	
7		88%		98%
8		80%		98%
9	62%	92%		
10		76%		100%
11			96%	98%
12	34%		88%	
13	18%		82%	
14		92%	92%	
15	66%		92%	
16		72%		96%
17	34%			100%
18		82%		98%
19			98%	98%
20			90%	98%
Mean	38%	83.2%	89.8%	98.4%
S.D.	19.6	6.3	4.7	1.3

Table 2

Individual Subject Data from the

Pointing, Closed Set Condition

Subject Number	0 dB SL	8 dB SL	16 dB SL	24 dB SL
1	78%	100%		
2	88%		98%	
3	86%			98%
4	82%	98%		
5	80%		96%	
6		98%	100%	
7		88%		96%
8		96%		100%
9	88%	96%		
10		94%		100%
11			96%	98%
12	74%		98%	
13	72%		98%	
14		92%	98%	
15	84%		98%	
16		94%		98%
17	88%			98%
18		96%		100%
19			96%	98%
20			96%	98%
Mean	82%	95.2%	97.4%	98.4%
S.D.	6	3.2	4	0.9

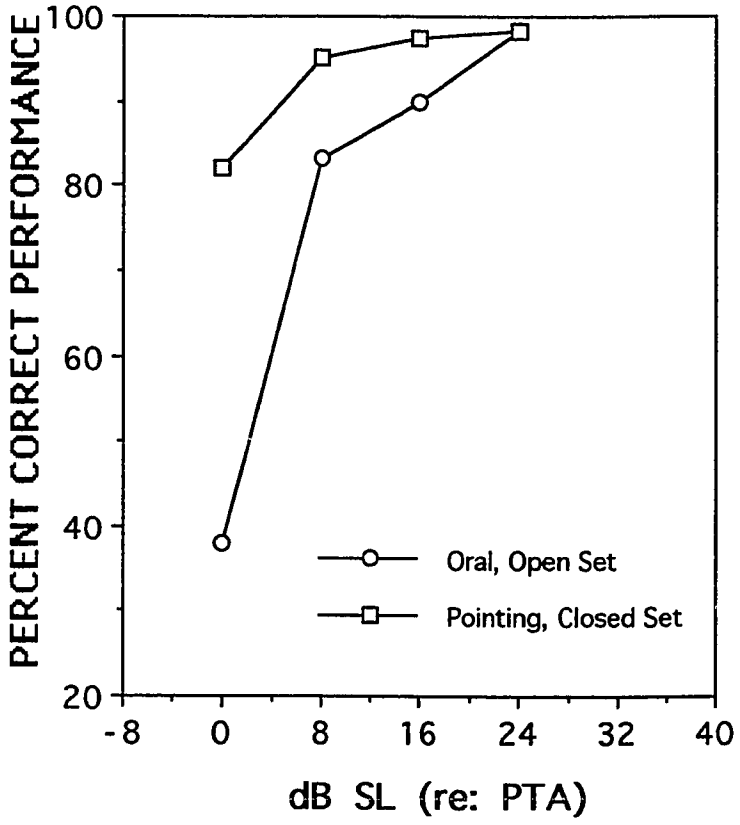

FIGURE 1. Psychometric functions for the oral, open-set conditions and the pointing, closed-set conditions.

CHAPTER V
DISCUSSION

The purpose of this study was to obtain normative data on a Spanish auditory/visual word-recognition test. The test design was chosen so that an English-speaking audiologist was able to administer the test to Spanish speakers. Subjects consisted of 40 volunteers (students and faculty) from various countries of origin in order to examine the effects of different dialectal and/or cultural backgrounds on performance. Subjects listened to auditory stimulus words under earphones and either repeated the stimulus words (oral, open-set conditions) or pointed to a picture on a color computer monitor representing the target word (pointing, closed-set conditions). Psychometric functions were obtained whereby mean percent correct performance was calculated as a function of sensation level (0, 8, 16, and 24 dB re: PTA). In this discussion, the data from the Spanish pointing, closed-set materials will be compared to previous results with English closed-set auditory/visual materials. Additionally, the psychometric functions from the oral, open-set conditions will be compared with the conventional Spanish word recognition tests (open set).

Comparison of Spanish and English Auditory/ Visual Materials

The results for the Spanish auditory/visual materials in the pointing, closed-set conditions revealed performance was good (>80%) at all presentation levels, with mean scores ranging from 82% at 0 dB SL to 98% at 24 dB SL. Data from a previous experiment using English auditory/visual materials (Wilson & Antablin, 1980), however, showed a more complete psychometric function ranging from 0% at -2 dB SL to approximately 98% at 26

dB SL.

These results indicate that the Spanish materials were easier than the English materials. A likely explanation for these findings involves the difference in syllable length between the English and Spanish target words. For example, many of the monosyllabic words in English were translated as either two or three syllable words in Spanish. For example, the word "bath" in English was translated as "baño" (two syllables), whereas the word "store" in English was translated as "tienda" (three syllables). For English monosyllabic words, a subject will receive fewer acoustic and/or phonetic cues than for two or three syllable words. In fact, Cancel (1965) has shown that while Spanish bisyllabic words result in similar psychometric functions as English monosyllabic words, Spanish trisyllables result in functions similar to English bisyllabic words. The practical result of the differences in syllable length appeared to be that there were more auditory cues for the Spanish words than for the Engish words at similar presentation levels. For example, for the target word "face," if the /s/ is inaudible, then there are many other possible words with initial /fa/. In Spanish, for the target word "dinero," if the initial /de/ is missed, then there are fewer possibilities for the final portions /nero/.

Wilson and Antablin (1982) did further study as to the performance of English auditory/visual word-recognition tests when the response alternatives are minimally varied (the response choices are similar except for one phoneme, for example, hose, bows, toes, and nose) as opposed to varied maximally (all phonemes in the response alternatives are different i.e. hose, match, ball, and tub). At a 0 dB signal-to-noise ratio the mean percent-correct performance for the minimally varied words was 84.1% and 97.7% for the maximally varied foils.

The conclusion from these data were that the minimally varied materials were more difficult.

The Spanish auditory/visual materials were categorized by syllable length (two and three syllable), gender, and acoustic phonetic similarity; however, the target words with the three alternatives were not minimally varied; for example, one quadrant was sapo, velo, vino and saco. The mean percent correct score for these materials was 82% at 0 dB SL, which is similar to the Wilson and Antablin(1982) data for the minimally and maximally-varied foils.

Comparison of Spanish Auditory/Visual and Spanish Conventional Materials

Weisleder and Hodgson (1989) evaluated one of the commercially available Spanish word recognition tests. Sixteen subjects listened to four lists of 50 bisyllabic words at 8, 16, 24, and 32 dB HL. The subjects listened to target words and repeated what they heard. The results indicated that the range of scores at the low presentation levels was very broad and became narrow at the high presentation levels (ceiling effect). Subjects from Mexico also were found to get better scores at the low presentation level than subjects from Panama, Venezuela, Spain, Honduras and Colombia. The words most often missed had the /s/ sound in one or two positions. They concluded that the psychometric function for the Spanish bisyllabic words was comparable to those of conventional English monosyllabic words.

In the current experiment, the range of scores (standard deviations) for the oral, open-set conditions also was broad at the low presentation level (0 dB SL) and decreased at the higher presentation levels. Mean performance correct was 38% at 0 dB SL, 83.2% at 8 dB SL, 89.8% at 16 dB SL and 98% at

24 dB SL. At similar sensation levels in the Weisleder and Hodgson (1989) study the mean performance correct was 22% at 8 dB HL, 56% at 16 dB HL, 82% at 24 dB HL, and 94.5 % at 32 dB HL. These results suggest that the auditory/visual materials are more intelligible, even at low sensation levels, as compared with the Weisleder and Hodgson (1989) study.

The differences in psychometric function between this investigation of these oral open-set, Spanish materials and the Weisleder and Hodgson (1989) investigation for an oral open-set response is thought to be because of some three syllable words in these materials (19 out of the 50 stimulus words were 3 syllable words). Recall that more acoustic information is available in three syllable words which in turn increases the liguistic information that can be used to correctly identify the word, even at low sensation levels.

Error Analysis

The number of times each word was missed at each presentation level was calculated for both the oral and pointing conditions in order to determine if some words were more difficult than others. Results of this error analysis are shown in Tables 3 (oral conditions) and 4 (pointing conditions). Recall that for the oral, open-set conditions, scores were low (32%) at the lowest presentation level but quickly improved as the intensity increased. For the pointing, closed-set conditions, individual performance ranged from 72-88% at 0 dB SL and improved to 88-100% at 8 dB SL.

For the oral, open-set responses the words most often missed by each subject at all sensation levels were "represa," "sapo," and "talón." These three words have voiceless stops. The /p/ in "sapo" and "represa" and the /t/ in "talón" are all voiceless stops but are placed in different places for articulation;

Table 3
The Number of Errors for Each of the Spanish Target Words in the Oral, Open-Set Test Conditions

Target	0 dB SL	8 dB SL	16 dB SL	24 dB SL	Total
tienda	9	3	2	0	14
saco	8	5	3	0	16
leño	10	4	1	0	15
rosa	7	3	1	0	11
molino	10	3	0	0	13
represa	9	5	7	0	21
barco	9	0	1	0	10
perla	9	1	0	0	10
marcar	7	0	0	0	7
pato	7	2	1	0	10
perro	4	2	0	0	6
lámpara	6	0	0	0	6
lata	8	4	0	0	12
cadena	7	1	1	0	9
hueso	10	1	0	0	11
escena	8	2	0	0	10
jamón	8	3	1	0	12
cama	2	0	0	0	2
dinero	4	0	1	0	5
abrigo	6	0	0	0	6
cortar	2	0	1	1	4
carga	7	1	0	0	8
cuenta	8	2	0	0	10
pelota	2	0	0	0	2
moneda	6	1	0	0	7
rueda	7	1	1	0	9
sapo	9	6	5	2	22
lago	3	0	0	0	3
roca	6	0	0	0	6
camino	7	2	0	0	9
cabeza	3	0	0	0	3
coro	8	1	0	0	9
puerta	4	0	3	0	7
tocar	5	0	0	0	5
gancho	9	1	0	0	10
pelo	4	2	0	0	6
máscara	5	1	0	0	6
jarra	7	2	1	0	10
cazuela	5	0	0	0	5
queso	4	3	1	0	8
escuela	5	0	0	0	5
talón	9	8	7	1	25
cara	3	0	0	0	3
ternero	8	2	2	1	13
abrazo	3	0	0	0	3
cantar	7	0	0	0	7
carne	8	2	0	0	10
cueva	3	1	1	1	6
peluca	2	0	0	0	2
muñeca	5	0	0	0	5

Table 4
The Number of Errors for Each of the Spanish Target Words in the Pointing, Closed-Set Test Conditions

Target	0 dB SL	8 dB SL	16 dB SL	24 dB SL	Total
tienda	9	2	0	0	11
saco	7	4	5	2	18
leño	9	3	0	0	12
rosa	2	0	0	0	2
molino	3	0	0	0	3
represa	0	2	1	0	3
barco	0	0	0	0	0
perla	2	0	2	0	4
marcar	0	0	0	0	0
pato	0	0	0	0	0
perro	0	0	0	0	0
lámpara	0	0	0	0	0
lata	1	0	0	0	1
cadena	0	0	0	0	0
hueso	0	0	0	0	0
escena	2	1	0	0	3
jamón	4	0	0	0	4
cama	1	0	0	0	1
dinero	0	0	0	0	0
abrigo	1	0	0	0	1
cortar	1	0	0	0	1
carga	6	0	0	0	6
cuenta	5	0	0	0	5
pelota	0	0	0	0	0
moneda	0	0	0	0	0
rueda	1	0	0	0	1
sapo	2	3	1	0	6
lago	0	0	0	0	0
roca	4	0	0	0	4
camino	4	0	0	0	4
cabeza	0	1	0	1	2
coro	0	0	0	0	0
puerta	2	1	2	0	5
tocar	1	0	0	0	1
gancho	0	0	0	0	0
pelo	1	0	0	0	1
máscara	0	0	0	0	0
jarra	5	0	0	1	6
cazuela	1	0	1	0	2
queso	1	0	0	0	1
escuela	0	0	0	0	0
talón	1	1	0	0	2
cara	0	0	0	0	0
ternero	7	1	4	3	15
abrazo	0	0	0	0	0
cantar	0	0	0	0	0
carne	7	2	0	0	9
cueva	0	1	0	0	1
peluca	0	0	0	0	0
muñeca	0	0	0	0	0

therefore, individuals often rely on visual cues for correct recognition. The /p/ in "sapo" was often substituted with a /k/ resulting in the error, "saco," the /ñ/ in "talón" was substituted with an /s/ resulting in the error, "salòn." Finally the /p/ in "represa" often was substituted with /g/ resulting in the error, "regresa." These types of errors are consistent with common errors in Spanish word-recognition tests noted by Weisleder and Hodgson (1989).

For the pointing condition, out of 134 errors, 90 of the errors were two syllable words and 44 were three syllable words. The first word "tienda" was missed 15 times which may have been a result of the subjects learning the task. Another word that was missed frequently was "ternero" (15 errors), this may have been a result from confusion of the pictures. Many subjects were not able to differentiate between the picture of the lamb (cabra) and calf (ternero). Consequently, if the errors for "tienda" and "ternero" are omitted the total number of errors for the three syllable words would be 17 and for the two syllable words 90 errors.

Interestingly, in the pointing conditions, the word most often missed was "saco" (bag). The subjects most often pointed to the alternative "sapo" (frog). Perhaps this is because, at the low levels, the /c/ and /p/ sounded very similar since the /c/ in "saco" is not strongly articulated. At the higher levels, the error may be due to vocabulary reasons. That is, the word "sapo" (frog) and the corresponding picture was recognized by all of the subjects, whereas "saco" (bag) was reported to be a burlap sac in some dialects. In these materials a brown paper bag represented the word "saco". Therefore, the subjects may have thought that they heard wrong, since no burlap sack was present and pointed to "sapo" (frog) instead.

Country of Origin

In order to determine any effects of culture or dialect, an analysis was done with percent correct tallied for subjects from each country of origin. These data are given in Table 5 (oral conditions) and Table 6 (pointing conditions). Subjects from Mexico for the oral, open-set, condition at the low sensation levels obtained better scores; however, as the sensation levels increased, the functions from the two groups concurred. For the pointing, closed-set, condition no country effects were noted, as not one group of people from a certain country did better or worse than another group. Additionally, the scores were not significantly different due to length of time in the United States. It was interesting, however, that some subjects indicated after the test session that they weren't familiar with some of the definitions of target words as illustrated by the pictures. For example, in the oral conditions the subjects repeated what they heard and had their own picture of what the word represents. However, in the pointing conditions, the subjects had their own picture of what they thought the word represented, but this occasionally was different from the picture in the test. Words that caused the most confusion were "saco" and "jarra." The picture representing "jarra" was a jar but many subjects knew "jarra" as a "pitcher"; nevertheless, these subjects were able to study the pictures and conclude that the jar was the closest representation of "pitcher." The other word "saco" was represented as a paper bag; however two subjects from Mexico, one from El Salvador, one from Ecuador and two subjects from Paraquay knew "saco" as a burlap sack for transporting flour or rice, but as for "jarra" they were able to conclude that the brown paper bag was the closest representation to "saco." In addition, in the American Spanish dialect "saco" is also known as a

Table 5

Percent Correct for each subject and country of origin for the Oral Closed Condition

Country of Origin	Time in U.S.A.	0 dB SL	8 dB SL	16 dB SL	24 dB SL
Mexico	13 years	64%	88%		
Mexico	28 years	34%		94%	
Mexico	11 years	34%		92%	
Mexico	10 years		76%		100%
Mexico	3 Years		92%	92%	
Mexico	8 years	66%		92%	
Mexico	23 years			72%	96%
Mexico	12 years			98%	98%
Mexico	20 years			90%	98%
Mean		49.5%	85.3%	90%	98%
U.S.A.	–	32%			100%
U.S.A.	–		80%		98%
U.S.A.	–	62%	92%		
U.S.A.	–	18%		82%	
U.S.A.	–		82%		98%
Puerto Rico	20 years	2%	80%		
Puerto Rico	46 years	34%			100%
Nicaragua	9 years		82%	94%	
El Salvador	10 years	34%	88%		
Colombia	5 weeks			96%	98%
Costa Rica	9 months		88%		98%
Mean		30.3%	84.5%	90.6%	98.6%

Table 6

Percent Correct for each subject and country of origin for the Pointing - Closed Set Condition

Country of Origin	Time in U.S.A.	0 dB SL	8 dB SL	16 dB SL	24 dB SL
Mexico	8 years	86%			98%
Mexico	10 years	82%	98%		
Mexico	16 years			96%	100%
Mexico	12 years	88%	96%		
Mexico	17 years	72%		98%	
Mexico	1 year		92%	98%	
Mexico	10 years	84%		98%	
Mexico	23 years		96%		100%
Mexico	20 years			96%	98%
Mexico	13 years			96%	98%
Mean		82.4%	95.5%	97.2%	98.8%
Paraguay	2 years		98%	100%	
Paraguay	4 years		94%		100%
El Salvador	13 years			94%	98%
El Salvador	12 years	88%			98%
U.S.A.	–		88%		96%
U.S.A.	–	74%		98%	
Peru	17 years		94%		98%
Colombia	5 years	88%		98%	
Ecuador	3 months	78%	98%		
Spain	1 year	80%		96%	
Mean		81.6%	94.4%	97.2%	98%

"little jacket;" however, none of the subjects were confused by this fact.

Future Research and Clinical Implementation

Further study is needed for the pointing closed-set condition since the psychometric function was not complete. The scores at 0 dB SL ranged from 72-88%; therefore, additional testing is needed at a lower sensation level for a complete representation of the psychometric function. The sensation level of 0 dB was chosen as the lowest level for this research because lower sensation levels typically are not administered in a clinical situation.

Finally, it must be noted that computers are rapidly becoming essential to the audiological evaluation. It is recommended that these materials be prepared for commercial distribution since the use of these Spanish auditory/visual test materials will enable an English speaking audiologist to administer a word recognition test in a timely and accurate manner. While implementing these Spanish auditory/visual materials in the clinic, adults should get a good score ($\geq$80%) at any sensation level above their pure-tone average. Any score below 80% could indicate auditory discrimination problems.

CHAPTER VI

SUMMARY

With the population of Spanish-speaking people growing every year, English-speaking audiologists need to begin to prepare proper testing materials. Along with the increased population of Spanish-speaking people is the increased use of computers in the audiological setting. Tests that use auditory/visual test materials to assess word-recognition performance fit into a computer administration and have been shown to be easily scored by English-speaking audiologists. That is, the visual stimulus pictures easily can be displayed on a computer monitor and words can be directed through the headphones while the audiologist initiates a target word from a list of words in the test booth.

In this study, performance data were obtained for Spanish auditory/visual materials using 40 normal hearing Spanish-speaking adults. The results indicated that performance was good in both oral, open-set conditions and pointing, closed-set conditions at high sensation levels. Further, the results showed that English speaking audiologists could easily administer the Spanish auditory/visual materials using the computer format.

Clinical Implications

In order for the audiologist to utilize the Spanish auditory/visual materials, a computer must be available in the clinical setting with a color monitor in the sound treated booth and a second monitor in the control room. With the use of these Spanish auditory/visual materials, the audiologist will be able to evaluate more accurately the hearing of people in the Spanish-speaking

community. Future research includes creating a more complete psychometric function for the pointing closed-set response by administering the test at a lower (negative) sensation level.

The use of this test paradigm also will be broadened to include many other languages to further the assessment of every patient in an audiology clinic.

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Appendix

Spanish Vocabulary Items

1.	**tienda** (store)	piedra (stone)	ramita (twig)	**rueda** (tire)
2.	velo (veil)	**sapo** (toad)	vino (wine)	**saco** (sack)
3.	**lago** (lake)	ceño (frown)	**leño** (log)	libro (book)
4.	ola (wave)	**rosa** (rose)	**roca** (rock)	rata (rat)
5.	anillo (ring)	**molino** (mill)	**camino** (path)	mendigo (bum)
6.	**represa** (dam)	**cabeza** (head)	carrera (race)	colina (hill)
7.	cono (cone)	baño (bath)	**barco** (boat)	**coro** (choir)
8.	**perla** (pearl)	pera (pear)	**puerta** (door)	cuerda (rope)
9.	girar (twirl)	asar (roast)	**tocar** (knock)	**marcar** (dial)
10.	**gancho** (hook)	gato (cat)	**pato** (duck)	gorro (cap)
11.	**perro** (dog)	**pelo** (hair)	palo (stick)	pico (beak)
12.	**máscara** (mask)	página (page)	cáscara (peel)	**lámpara** (lamp)
13.	**jarra** (jar)	cara (face)	**lata** (can)	rata (rat)
14.	culebra (snake)	**cadena** (chain)	escuela (school)	**cazuela** (pan)

15.	**hueso** (bone)	fuego (fire)	pueblo (town)	**queso** (cheese)
16.	**escena** (stage)	estrella (star)	**escuela** (school)	espalda (back)
17.	ladrón (thief)	**talón** (heel)	bastón (cane)	**jamón** (ham)
18.	**cara** (face)	coca (Coke)	**cama** (bed)	cabra (goat)
19.	cordero (lamb)	**dinero** (cash)	sombrero (hat)	**ternero** (calf)
20.	**abrazo** (hug)	payaso (clown)	regazo (lap)	**abrigo** (coat)
21.	**cantar** (sing)	correr (run)	**cortar** (cut)	cavar (dig)
22.	carcel (jail)	**carga** (load)	cabra (goat)	**carne** (meat)
23.	cuerda (rope)	**cuenta** (bill)	**cueva** (cave)	choza (hut)
24.	pastilla (pill)	**peluca** (wig)	piscina (pool)	**pelota** (ball)
25.	**moneda** (dime)	**muñeca** (doll)	muchacha (girl)	mejilla (cheek)